

Vaisala TLS200, Technological Advancements for VHF total lightning mapping

/ Nikki Hembury and Ron Holle - Vaisala
/ Southern Thunder Conference 2011

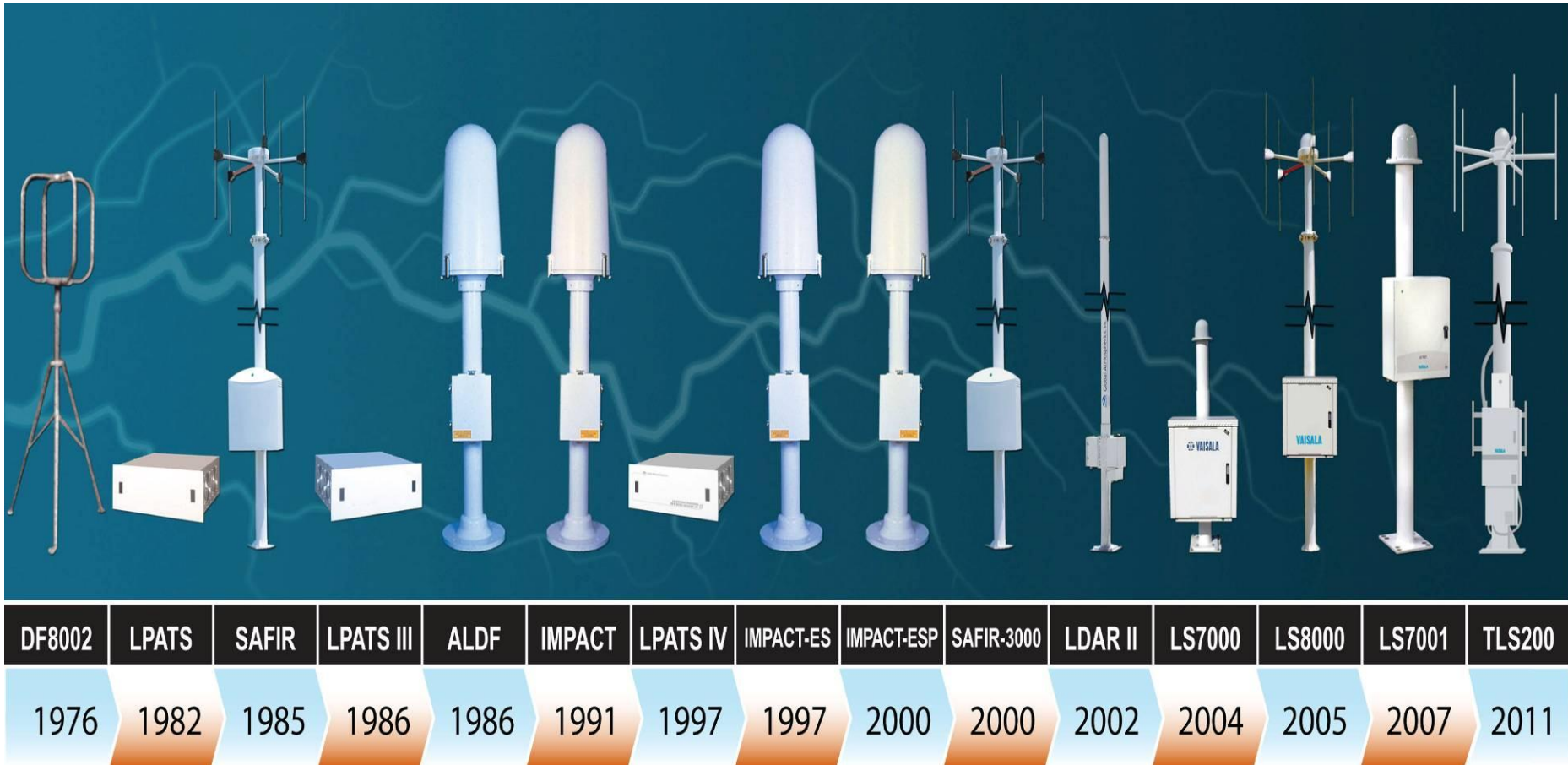
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Sensor History

Sensor (launch)	Status	Frequency	Location Method
DF 8002 (1976)	<i>Obsolete</i>	LF/VLF	DF
LPATS (1982)	<i>Obsolete</i>	LF/VLF	TOA
SAFIR (1985)	<i>Obsolete</i>	VHF/LF	Interferometry
LPATS III (1986)	<i>Obsolete</i>	LF/VLF	TOA
ALDF (1986)	<i>Obsolete</i>	LF/VLF	DF
IMPACT (1991)	<i>Obsolete</i>	LF/VLF	DF and TOA
IMPACT ES (1996)	<i>EOSL</i>	LF/VLF	DF and TOA
LPATS IV (1997)	<i>EOSL</i>	LF/VLF	TOA
IMPACT ESP (2000)	<i>EOSL</i>	LF/VLF	DF and TOA
SAFIR 3000 (2000)	<i>EOSL</i>	VHF/LF	Interferometry
LDAR-II	<i>Obsolete</i>	VHF/LF	TOA
LS7000 (2004)	Supported	LF/VLF	DF and TOA
LS8000 (2005)	Supported	VHF/LF/VLF	DF, TOA & Interferometry
LS7001 (2007)	Current	LF/VLF	DF and TOA
TLS200 (2011)	Current	VHF/LF/VLF	DF, TOA & Interferometry

DF = Direction Finding, EOSL = End of Service Life, LF = Low Frequency, TOA = Time of Arrival, VHF = Very High Frequency, VLF = Very Low Frequency

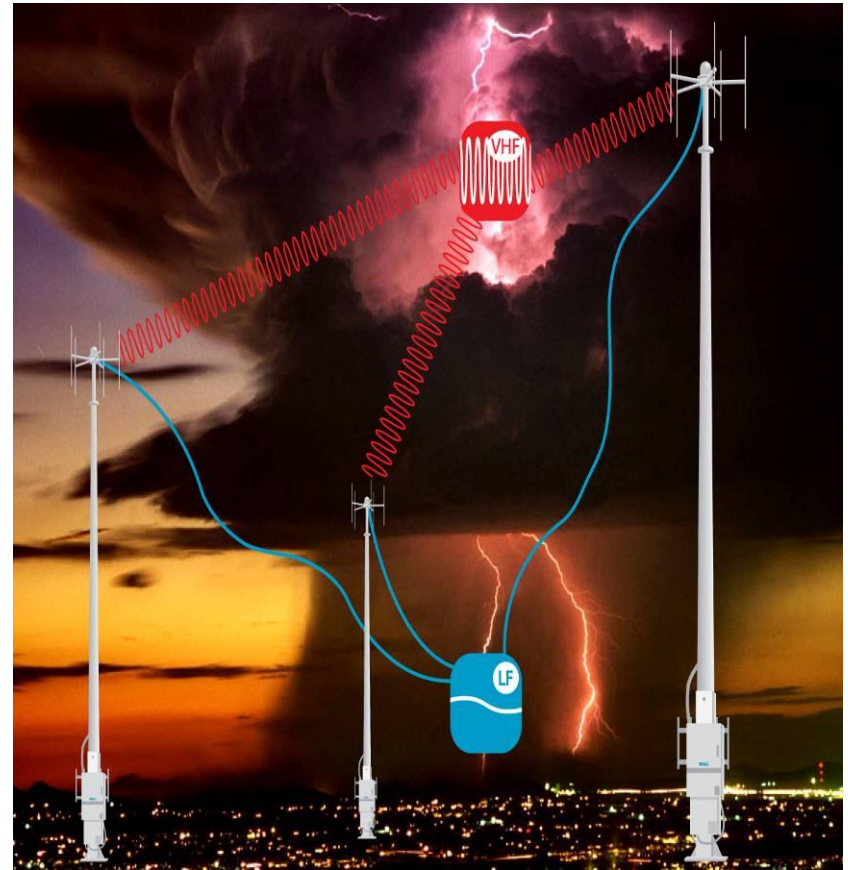
Timeline of Products



Vaisala Technology Combines Best Techniques for Total Lightning Detection

■ Vaisala Thunderstorm Lightning Sensor TLS200

- Use VHF interferometry techniques for the finest cloud lightning detection
 - greater than **90% detection**
 - plus mapping of the **full cloud channel in 2D**
 - Similar to LMA cloud and LDAR II cloud mapping
- Use proven LF combined **Magnetic Direction Finding (MDF)** plus **Time of Arrival (TOA)** techniques for accurate and finest Cloud to Ground locations.



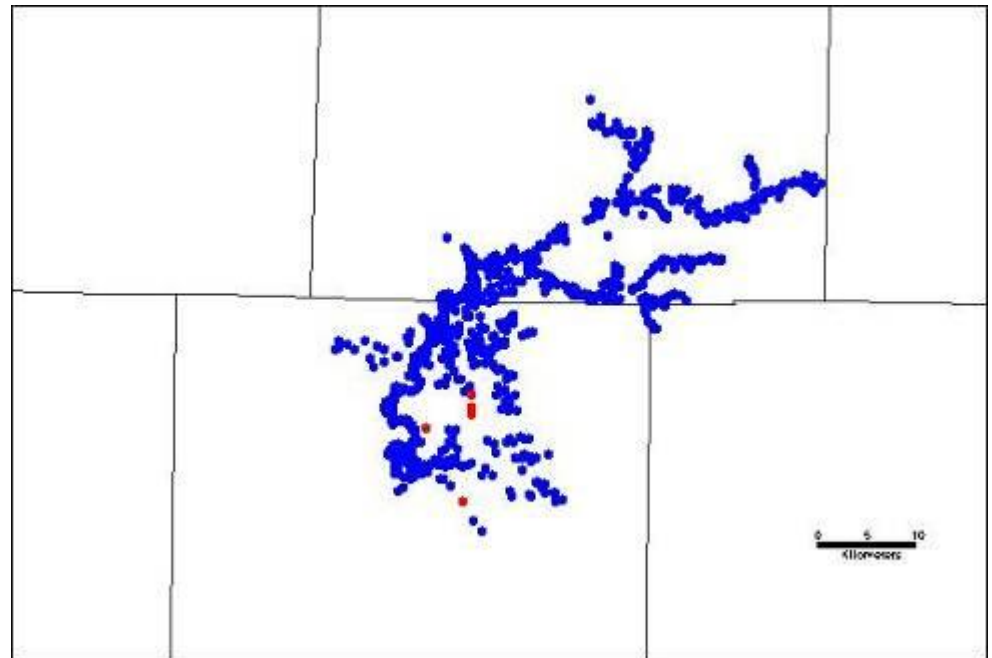
VHF total lightning mapping versus VLF/LF cloud lightning detection networks

Flash-scale

- Detect a fraction of all cloud flashes (typically 5-50%)
- Only maps areas around the initiation points of cloud flashes

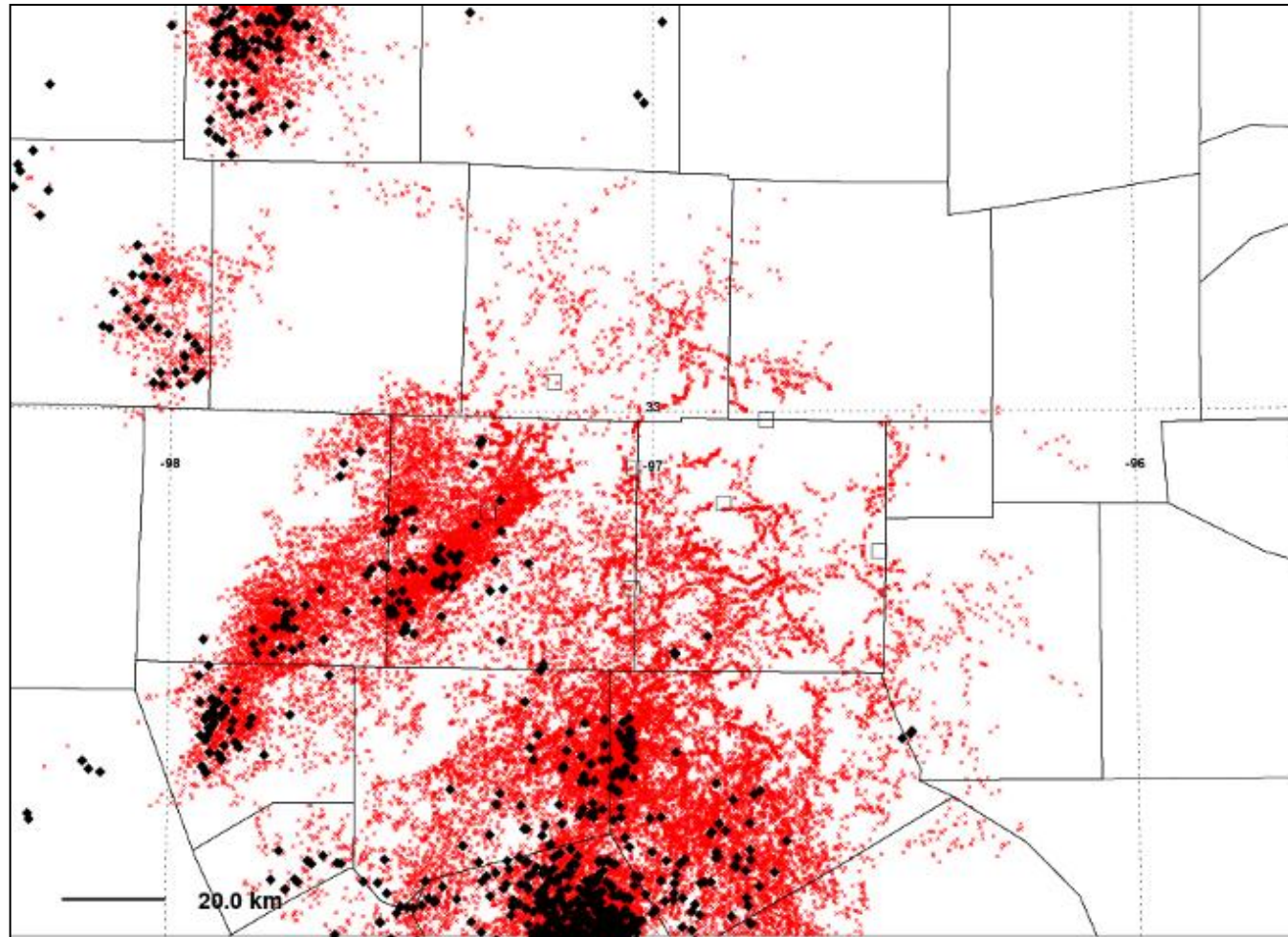
Blue – VHF cloud lightning mapping

Red – VLF/LF cloud lightning detection



VHF total lightning mapping versus VLF/LF cloud lightning detection networks

Storm-scale



TLS200 Sensor

Total Lightning Detection (>90% CG+IC with mapping)

■ Technology:

- VHF Interferometry combined with LF Time of Arrival (TOA) and Magnetic Direction Finding (MDF)
- VHF for 2D cloud lightning aerial mapping
- LF for accurate CG detection (as used in NLDN®)

■ Benefits:

- Sigmet® digital signal processing for improved signal to noise ratio (10dB improvement)
- Longer baseline network, fewer sensors to cover same area as compared to VHF-TOA (LDAR II) and VHF-ITF (LS8000)
- Accurate LF CG data, improvements to 150 meter Location Accuracy
- Lower overall cost of ownership for a network
- VHF only option to further reduce costs to owners
- Easy to install, service and maintain



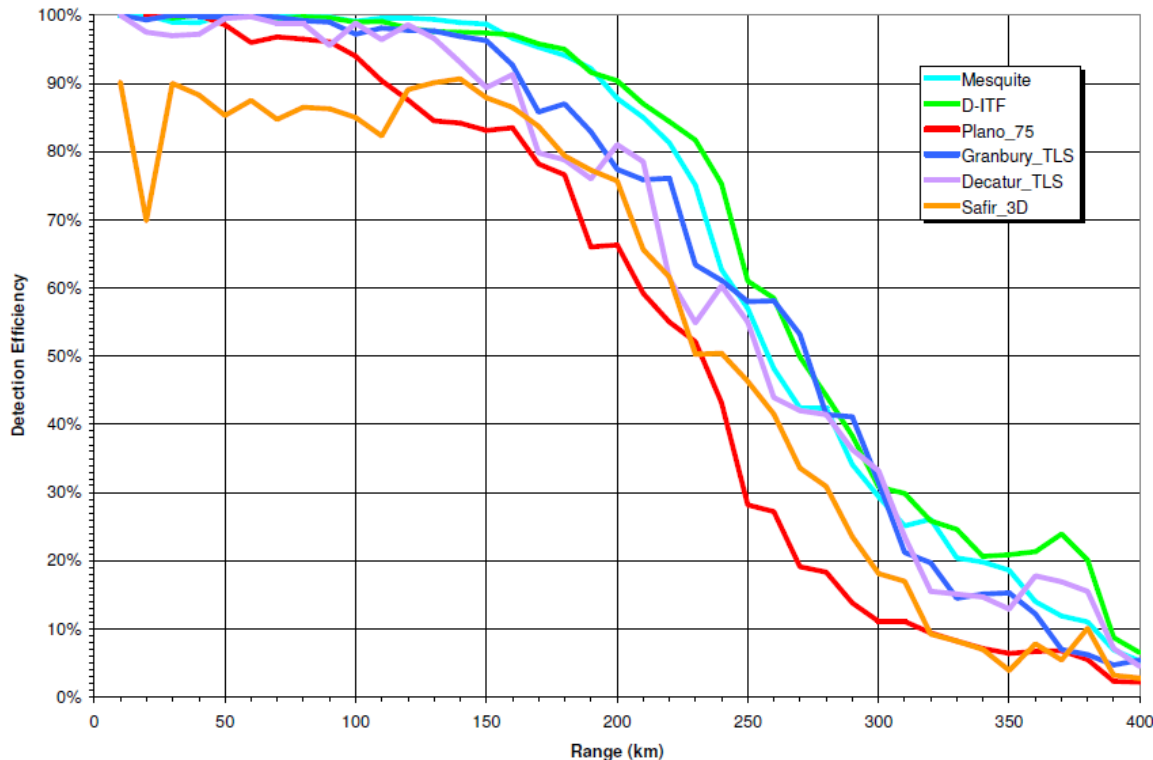
Texas Installation(s)



Arizona Installation

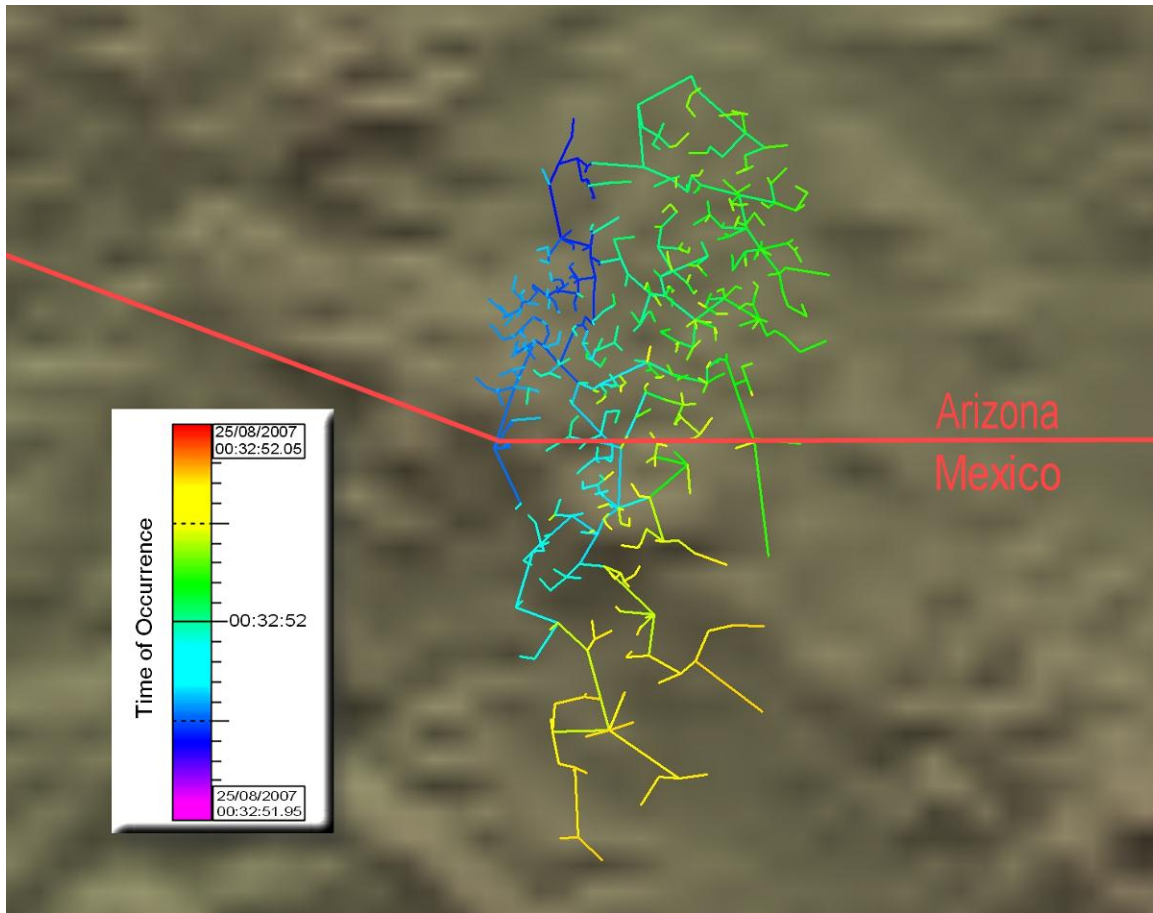


VHF performance results / field results



- Data shows that the digital interferometry (TLS200) implementation is capable of delivering >90% DE at a range of almost 200km.
- This is almost 2-fold improvement for detection in VHF as previous products.

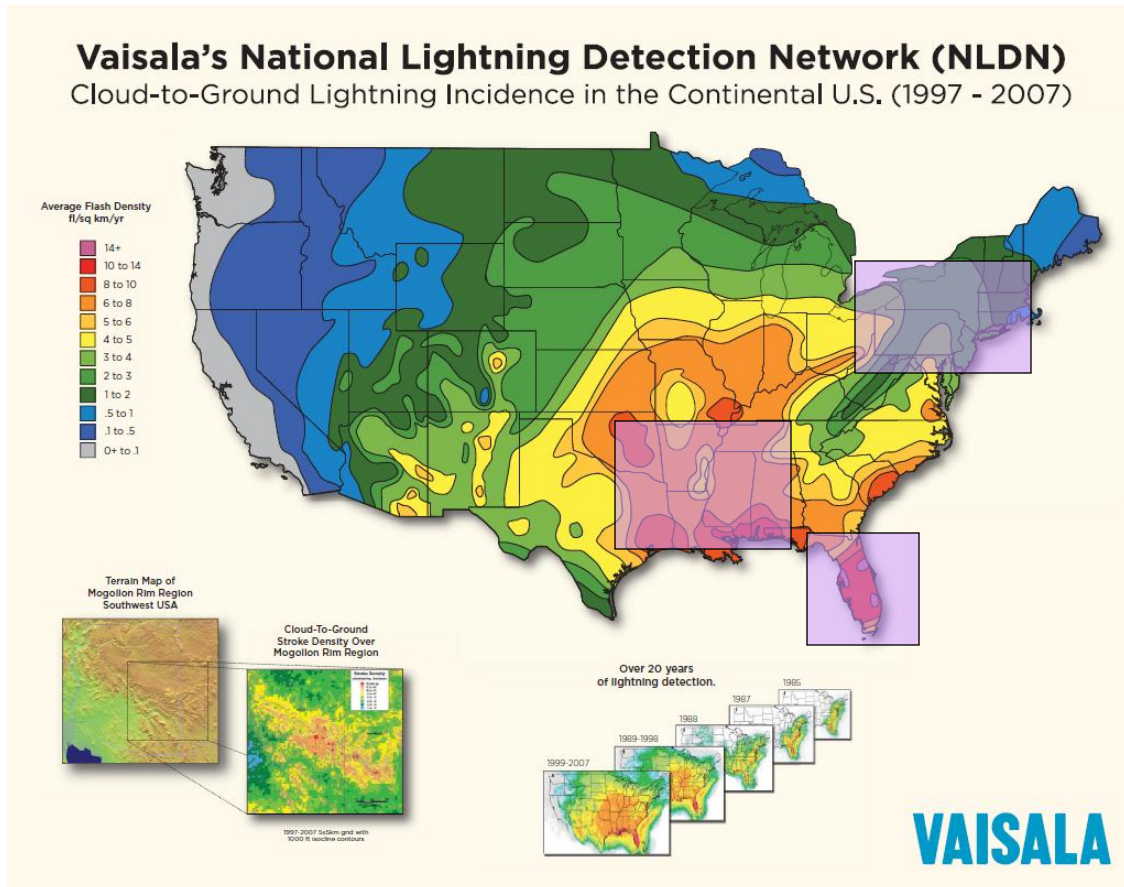
Vaisala TLS200, IC mapping



■ One example:

- Extension NS = 30km
- Extension EW = 10km
- Duration ~100ms
- 621 VHF sources

NLDN® Total Lightning expansion



- NLDN® expansion to TLS200 product
- The best detection capability
- Properly grouping cloud pulses without exaggerating DE claims
- Validation through third party studies and ground truth/high speed video campaigns

2012 ILDC/ILMC

- 22nd International Lightning Detection Conference
- 5th International Lightning Meteorology Conference
- April 2-5, 2012
- Renaissance Boulder Flatiron Hotel, Broomfield, Colorado
- Theme: The value of lightning information for safety and asset protection



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